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(54) **Thermostatically controlled trap**

(57) In a thermostatically controlled trap, one end of a valve pushrod 16 directly engages a ball valve 18 when the valve pushrod is subjected to axial motion in response to the expansion of a thermosensitive member 11 caused by a change in temperature of fluid flowing through the trap.

FIG.1

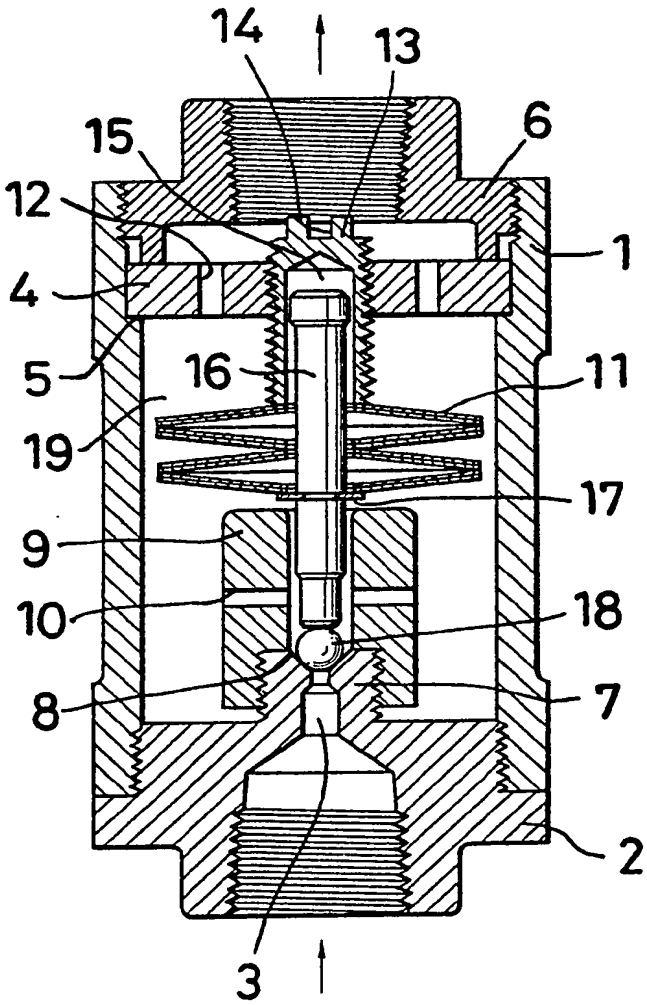

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FIG.1

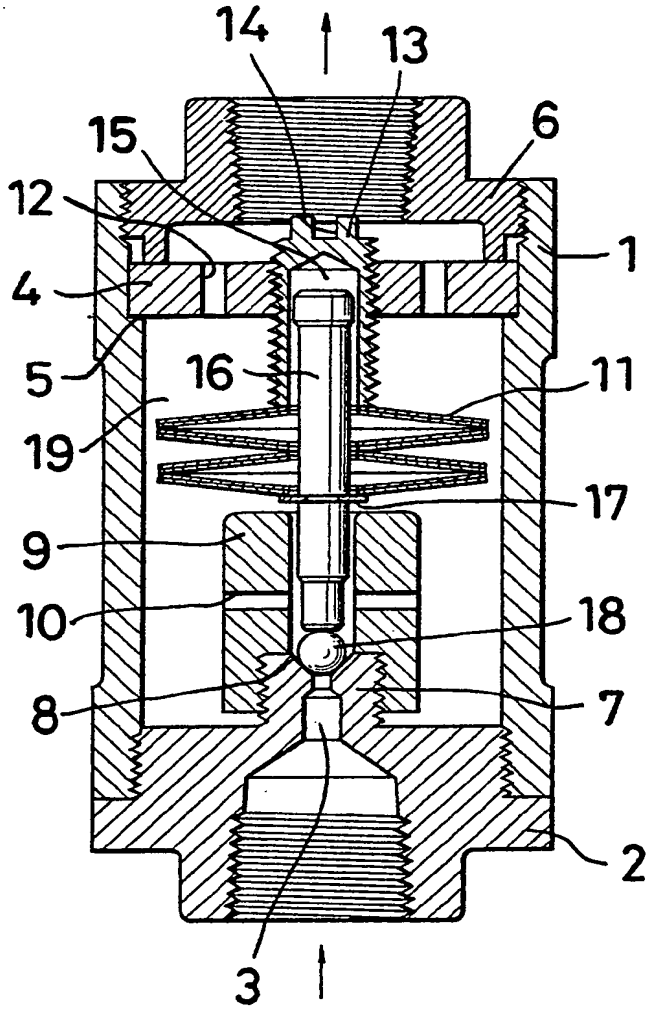
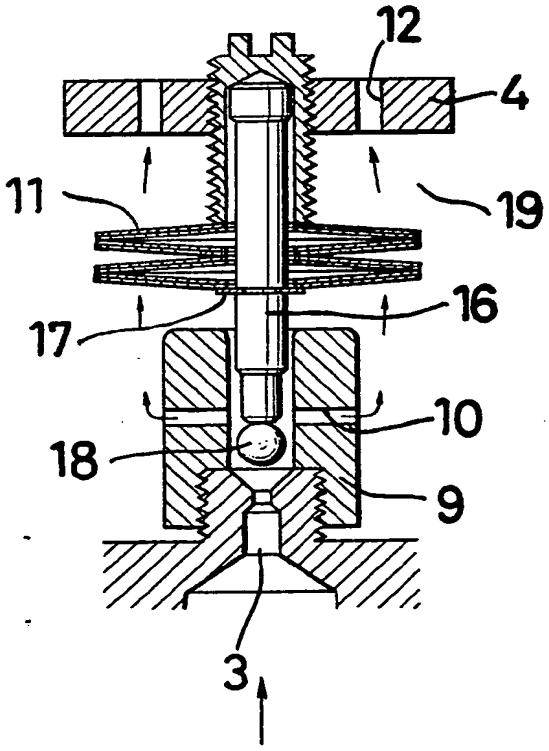


FIG.2



SPECIFICATION

Thermostatically controlled trap

The present invention relates to a thermostatically controlled trap.

A thermostatically controlled trap has so far been considered unfit for use in a trace pipe or in a piping for instrumentation where only a very small amount of condensate is produced and the pressure and temperature of fluid are subject to sharp fluctuations.

It is an object of the present invention to provide a thermostatically controlled trap which works in a stable manner even in such a piping.

With the above-mentioned object in view and as will become apparent from the following detailed description, the present invention will be more clearly understood in connection with the accompanying drawings.

Fig. 1 is a cross-sectional view of a trap according to the present invention with the valve closed; and

Fig. 2 is a cross-sectional view of a part thereof with the valve opened.

Referring now to Fig. 1, a trap in accordance with the present invention includes a barrel 1, a pipe joint 2 which is provided with an inlet port 3 coaxially with the barrel 1 and screwed into the lower end of the barrel 1 for connecting an inlet pipe, a disk 4 resting on an annular shoulder 5 formed on the internal surface of the barrel 1 near the upper rim thereof, and having a hole in its center, another pipe joint 6 screwed into the upper end of the barrel 1 for connecting an outlet pipe and adapted to hold the disk 4 against the annular shoulder 5, and an adjusting bolt 13 having a head with a slot of recess 14 and screwed into the center hole of the disk 4. In the alternative, the disk 4 and the pipe joint 6 may be integral.

The inlet port 3 extends through a projection 7 which is provided at the inside or top center of the pipe joint 2 coaxially therewith. A conical valve seat 8, on which a ball valve 18 rests, is formed on the inner or upper rim of the projection 7.

An extension pipe 9 is screwed on the projection 7 coaxially therewith. A plurality of radial holes 10 are provided through the wall of the extension pipe 9 in the midportion thereof with angularly equal spacings.

In the alternative, the pipe joint 2 may not be provided with the projection 7, and the extension pipe 9 may be adapted to be screwed into the top of the pipe joint 2. In this case, the conical valve seat 8 may be formed on the internal surface of the extension pipe 9.

The disk 4, which defines a chamber 19 together with the barrel 1 and the pipe joint 2, is provided with a plurality of holes 12 axially extending with angularly equal spacings.

The adjusting bolt 13 has a blind hole 15 opening inwardly or downwardly. The blind hole 15 is axially aligned with the extension pipe 9. Slidably disposed in the extension pipe 9 and the blind hole 15 is a valve pushrod 16, the inner or lower end of which is of a reduced diameter to assure smooth flow of water through the inlet port 3 and the holes 10.

A ring 17 is fixed on the valve pushrod 16 midway between the upper rim of the extension pipe 9 and the lower rim of the adjusting bolt 13.

A thermosensitive member 11 made of laminated bimetal fits on the valve pushrod 16 with its upper end abutting to the lower rim of the adjusting bolt 13 and its lower end abutting to the ring 17.

In the alternative, the member 11 may be a bellows containing a thermosensitive liquid which expands and contracts with the change in temperature.

The valve pushrod 16 has a plane surface at the lower end and comes in direct contact with the ball valve 18 when the valve pushrod 16 is subjected to axial motion by the expansion of the member 11.

In operation, as long as the temperature of the fluid arriving at the inlet port 3 is below the set value, the thermosensitive member 11 continues to be in a constricted state as shown in Fig. 2 so that the valve pushrod 16 is held in a lifted position of the valve seat 8. The fluid pressure continues to push up the ball valve 18 so as to permit the flow of the fluid.

When a fluid at a temperature above the set value flows into the chamber 19, the member 11 expands, pushes down the valve pushrod 16, and allows it to press the ball valve 18 against the valve seat 8 so as to block the flow of the fluid.

When the temperature of the fluid in the chamber 19 falls below the set value, the member 11 contracts again into the state shown in Fig. 2 and permits the fluid to flow through the trap.

Since the ball valve 18 is light in weight, it is freely rotated even by a very small amount of the fluid flowing through the inlet port 3. The rotation of the ball valve 18 prevents scale from being deposited not only on the surface of the ball valve 18 but also on the surface of the valve seat 8, because the ball valve 18 sometimes rotates while keeping in touch with the valve seat 8.

The holes 10 and 12 allow the whole surface of the member 11 to come in uniform contact with the fluid so as not to cause time lag in the operation of the member 11 in response to a change in the fluid temperature. In addition, because the expansion and contraction of the member 11 is not so abrupt, a sudden closure of the ball valve 18, sharp pressure change at the inlet side and water hammer can be avoided.

For adjusting the position of the adjusting bolt 13 with relationship to the extension pipe 9, the adjusting bolt 13 is turned with a screwdriver in the slot or recess 14 in its head.

The contact between the lower end of the pushrod and the ball valve is maintained even if the ball valve is out of alignment with the pushrod.

While we have disclosed a preferred embodiment of the present invention, it is to be understood that it has been described by way of example only, various other modifications being obvious.

CLAIMS

1. A thermostatically controlled trap comprising a barrel, first pipe-joint means disposed at one end of the barrel for connecting an inlet pipe to the trap and having an extension pipe provided with a plurality of radial holes in a midportion thereof, a ball valve located adjacent the junction between the extension pipe and the first pipe joint, second pipe-joint means disposed at the opposite end of the barrel for connecting an outlet pipe to the trap and provided with a plurality of holes, an adjusting bolt having a blind hole opening inwardly of the barrel and supported by said second pipe-joint means, a valve pushrod slidably disposed in the extension pipe and said blind hole, and thermosensitive means for subjecting said valve pushrod to axial motion in response to a change in temperature of fluid flowing through the trap.

2. A thermostatically controlled trap as claimed in claim 1, wherein the first pipe joint has a substantially coaxial projection directed inwardly of the barrel and the ball valve comprises a valve ball cooperating with a valve seat formed in the rim of said projection, and wherein the extension pipe is fastened to the projection.

3. A thermostatically controlled trap as claimed in claim 1 or 2, wherein the second pipe joint means comprises a pipe joint disposed at said opposite end of the barrel for connecting the outlet pipe to the trap, and a disk provided with a plurality of axial holes mounted inwardly of the second pipe joint, the adjusting bolt being screwed into a center hole in said disk.

4. A thermostatically controlled trap as claimed in claim 1, 2 or 3, wherein the thermosensitive means comprises a ring fixed to the valve pushrod intermediate the inner rim of the extension pipe and the inner rim of the adjusting bolt, and a thermosensitive member made of bimetal laminate and fitted onto the valve pushrod with one end abutting said rim of the adjusting bolt and its opposite end abutting said ring.

5. A thermostatically controlled trap as claimed in claim 1, 2 or 3, wherein the thermosensitive means comprises a ring fixed to the valve pushrod intermediate the inner rim of the extension pipe and the inner rim of the adjusting bolt, and a bellow fitted onto the valve pushrod with one end abutting said rim of the adjusting bolt and its opposite end abutting said ring, said bellows containing a thermosensitive liquid.

6. A thermosensitive controlled trap constructed and adapted to operate substantially as hereinbefore described with reference to the accompanying drawings.

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